Citation:

Carruth BR, Skinner JD. The role of dietary calcium and other nutrient in moderating body fat in preschool children. *International Journal of Obesity* 2001; 25: 559-566.

Worksheet created prior to Spring 2004 using earlier ADA research analysis template.

PubMed ID: 11319662

Study Design:

Cohort Study

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To assess preschool children's food consumption (24-60 months) and relate these findings to body composition at 70±2 months.

Inclusion Criteria:

Participation in an earlier study (subset of subjects from that study). See Skinner and Carruth 1999.

Exclusion Criteria:

None reported.

Description of Study Protocol:

Diet

Registered Dieititans conducted in-home interviews with mothers when their children. Three day dietary intakes were obtained at24, 28, or 32 and 28, 32, or 36 months (two interviews=child in the third y); all children were seen at 42, 48, 54, and 60 months of age.

Anthropometrics and Body Composition

Children's height and weight were measured at each of the six in-home interviews.Body composition was assessed at 70±2months, using DEXA. No follow-up body composition measurements were done for 12 children who could not meet the 70 months time frame or the seven who declined participation in the body composition assessment.

Data Collection Summary:

Duration: 3 **years**

Variables

   Dependent:

   Body fat (%) and total body fat (g) (DEXA, dual energy X-ray absorptiometry).

   Independent:

   Dietary Intake: protein, carbohydrate, dietary fat (saturated, monounsaturated, & polyunsaturated fat), calcium, vitamin D and vitamin A, & riboflavin (average of 3-day dietary data, included 2 weekdays & 1 weekend day, at all 6 interviews).

   Confounding:

   BMI, Gender, Parent's BMI.

Location: Tennessee

Statistical analyses:

General Linear Models (GLM) (to relate longitudinal dietary intakes to children's body composition at 70 months).

Description of Actual Data Sample:

- 53 healthy, white preschool children (29 males & 24 females)
- Middle-upper class families
- 24 – 72 months of age (2 – 6 y)

Summary of Results:

Energy and Macronutrients

- **Energy:** Mean group energy intakes exceeded the allowance of 1300 kcal/day for children 1 to 3 years, but were less than 1800 kcal/day for 4 to 6-year-olds.
- **Fat:** Children in the study did not gradually decrease their fat intake over time, but had mean intakes of about 31% by 12 months of age (although the amount of saturated fat exceeded the recommended 10% to achieve the energy from fat to saturated fat ratio of 30:10 by age 5). The most frequently consumed foods with larger amounts of fat included: cheeses, 2% fat milk and ice cream.
- **Protein:** The protein intakes were 2 to 3 times the RDA

Micronutrients

- Mean intake of **vitamin D** over time was >90% of Adequate Intake (AI),
- **Vitamin A** intakes consistently exceeded the recommended allowance for children,
- Mean **calcium** intakes (24 ± 60 months) ranged from 791±252 to 968±340 mg/day (males) and 698±224 to 808±375 mg/day (females), meeting or exceeding 95% of the new AI for calcium for children, 1 to 3 and 4 to 6 years of age.
- **Vitamin E** intakes ranged from 48 to 51% of the recommended amount.

Predicting Body Fat from Intake

General linear modeling procedures were used to relate dietary intake to children's body composition.

Percent and grams of body fat adjusted for BMI was:

- Positively related to mean longitudinal intakes of dietary fat and protein,
- Negatively related to calcium and monounsaturated fat intakes.

These results suggest that higher mean longitudinal intakes of calcium and monounsaturated fat were associated with lower body fat at 70 months.

Adjusting for BMI, the variability in percent body fat was:

- Negatively related to mean longitudinal servings per day of dairy products and gender,
- Positively related to protein.

For the model using total g body fat, higher mean longitudinal servings per day of dairy products and monounsaturated fat

Calcium: The children's percent and g body fat was negatively related to calcium intake (%: -0.015, P=0.0003; g: -3.78, P=0.0003).

Author Conclusion:

These results support the relationship between higher calcium intakes and dairy products and lower body fat.

Reviewer Comments:

These results are consistent with dairy products in the model, as dairy products were the richest sources of calcium and monounsaturated fat in the children's diets.

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	N/A

Validity Questions	
1. **Was the research question clearly stated?**	Yes

1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	N/A
2.3.	Were health, demographics, and other characteristics of subjects described?	No
2.4.	Were the subjects/patients a representative sample of the relevant population?	No
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	Yes
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	N/A
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	N/A
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes

4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A

5. **Was blinding used to prevent introduction of bias?** — Yes

5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A

6. **Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?** — Yes

6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A

7. **Were outcomes clearly defined and the measurements valid and reliable?** — Yes

| 7.1. | Were primary and secondary endpoints described and relevant to the question? | Yes |
| 7.2. | Were nutrition measures appropriate to question and outcomes of concern? | Yes |

7.3.	Was the period of follow-up long enough for important outcome(s) to occur?		Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?		Yes
7.5.	Was the measurement of effect at an appropriate level of precision?		Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?		No
7.7.	Were the measurements conducted consistently across groups?		N/A

8. Was the statistical analysis appropriate for the study design and type of outcome indicators? — Yes

8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A

9. Are conclusions supported by results with biases and limitations taken into consideration? — Yes

9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes

10. Is bias due to study's funding or sponsorship unlikely? — Yes

10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes

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